Endogeneity in the European import demand for soybean: the role of Genetically Modified Organisms

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Soybeans and soybean meal in the EU

Limited European supply:

- unfavorable climate in most MSs;
- frequent changes in CP have addressed farmers’ decisions (Bertheau and Davidson, 2011).

High demand supported through import:

- grains: 14.5 mmt annual avg. during 2005-2014;
- main exporters: BR (47%), USA (35%), PRY (10%), CAN (7%);
- meal: 21 mmt annual avg. during 2005-2014;
- main exporters: BR (47%), ARG (35%), USA (9%), PRY (1.5%).

Soybean source differentiation

Imperfect substitution due to source-specific features, i.e. different reputations for product's quality, quality consistency, reliability, supply chain management, etc. (Washington and Kilmer, 2002).

The case of soybean: different exporters typically have

- different GM approval statuses (AA);
- uneven supply chain management systems;
- products with different nutritional characteristics (Griepsho and Fahey, 2011).

GMOs:

- New varieties rarely introduced in exporting countries;
- National GMO regulations.

EU «zero tolerance policy» + AA → Trade disruptions → need for effective upstream product management.

Objectives

- Provide up-to-date cross-country import elasticities for soybean;
- exploit a theoretical specification derived from producer theory;
- take into account exporter-specific characteristics which might impact import prices, but generally unobserved in structural demand models.

Model Specification

Prices for differentiated products typically incorporate demand and supply characteristics: price endogeneity may arise in demand systems whenever some of the price determinants involve unobserved demand characteristics (Dhar, 2003).

First stage: regress unit prices on a vector of source-specific characteristics.

Regressors’ choice: general contributions such as Clark et al. (2004), Beverelli et al. (2010), Faria and Wieck (2014,2015), Henseler et al. (2013), Harri et al. (2009).

Estimation Results

First-stage:

- price equation estimated through HAC-POLS
- $AA_{it}, DIST_{it}, OIL_{it}$ significant at 1-5%
- $q_{it-1}$ indicates the presence of economies of scale

Second-stage:

- Homoskedastic system FGLS with symmetry and homogeneity imposed.
- Conditional Hicksian elasticities: $\eta_{it} = \frac{\text{price of soymeal}}{\text{price of soybean}}$
- Conditional own-price and cross-price elasticities:

Conclusions

Residuals significant at 5% and 10% in the equation for the USA and PRY: prices endogeneity detected (but very weak in PGY).

- Complementarity between USA/CAN and BR/PRY;
- substitution between South America and North America;
- USA and CAN share a number of country and product-specific characteristics; the same is true for BR and PRY (less trivially);
- cross-price elasticities put less weight on soybean country-specific characteristics and place more emphasis on seasonal/price driven substitution;
- high own-price elasticities corroborate this result.

Selected references:


A. Muhammad, R.L.Kilmer,“The impact of EU export subsidy restrictions on USA dairy exports”, Agribusiness, 24(4), 2008.